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A NEW SPECIES OF *BLEPHILIA* (LAMIACEAE) FROM NORTHERN ALABAMA

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ABSTRACT

Blephilia subnuda Simmers & Kral is described from the Cumberland Plateau province of northern Alabama. This species is compared with other species and forms of *Blephilia*, from all of which it differs in its puberulent calyx tube. From *B. ciliata* it differs primarily also in having serotinous decumbent offshoots, stems glabrate below the middle, leaves glabrate, calyx mostly shorter, and corollas paler in ground color (white to pale purple). From glabrate forms of *B. hirsuta* it differs primarily in stem vestiture, leaves with fewer trichomes, calyx with longer, puberulent tube and longer teeth of lower lip, and darker nutlet color.

Key Words: *Blephilia*, new species, northern Alabama

INTRODUCTION

Blephilia Rafinesque has been considered by all recent authors to comprise two somewhat variable species, namely *B. ciliata* (L.) Benth. (*Monarda ciliata* L., Sp. Pl. 23, 1753) and *B. hirsuta* (Pursh) Benth., both confined to eastern North America. The former has its morphs most often in open areas, open woods and glades. In strong contrast is the other previously described species, *B. hirsuta*, which is primarily a mesic-woodland plant, taller (usually over 1 m), with softer, stouter stems, larger, thinner, smoother and sharper-tipped leaves, paler and softer inflorescences, shorter calyces, smaller and paler corollas and larger resin dots. The two have a broad sympatric range, namely from Vermont south to northern Georgia, west to southern Ontario, Iowa and Missouri. *Blephilia ciliata* ranges further south, into the Coastal Plain of Alabama, Mississippi, Arkansas and Oklahoma, while *B. hirsuta*

extends further north, into Minnesota and southwestern Quebec, as well as occupying higher elevations in the southern Appalachians.

Thus we note that these two blephilias share much geographic range but overlap little in habitat; however, the two species do at times share some habitat. We have identified putative hybrids, ostensibly allowing genetic exchange by backcrossing. But even working within such a context and even when such intermediates have been identified, we have come across plants of still another and distinctive morphology that cannot be explained in terms of character states either shared or distinctive to one or the other. This taxon, discovered by the senior author in 1972 and located in the rugged, calcareous, wooded terrain of the Cumberland Plateau of northeastern Alabama, we are proposing as a new species.

Blephilia subnuda* Simmers & Kral, *sp. nov.

Haec species habitu cum *Blephilia ciliata* (L.) Benth. optime congruens sed differt stolonibus per florescentiam nullis, caulibus inferne glabratis, superne trichomatibus pro parte maxima in duobus lateribus sulcatis supra petiolos foliorum praeditis, laminis subtus glabratis, tubis calycum externe puberulis (trichomatibus usque ad 0.6 mm longis, pro parte maxima 0.03–0.10 mm longis).

Strict perennial herb (25–) 30–60 cm high, perennating by decumbent offshoots to 25 cm long, these produced only after anthesis. Sterile and fertile stems mixed in lax clusters, the stems at anthesis ca. 1–3 mm thick, the upper internodes above petioles sulcate, the branching (if present) ascending; stem surfaces commonly greenish to deep purple, glabrous or sparsely and minutely puberulent to glandular-puberulent, also with frequent tiny resin-dots from base to midstem, then from ca. midstem to tip of inflorescence, sparsely to densely mixed-trichomiferous, the trichomes spreading to recurved, even appressed, unicellular to multicellular, the longest on nodes and stem angles. Leaves spreading or slightly ascending, in the inflorescence sometimes reflexed (mostly spreading), the petioles (0.25–) 0.5–2.0 (–2.5) cm long, ciliate, puberulent; blades broadly ovate to narrowly oblong or lanciform, broadest in outline at stem base, largest at ca. midstem, progressively smaller, narrower, subsessile or sessile upstem into the inflorescence, the largest ones (2.6–) 3.6–10 (–11.9) cm long,

(0.9–) 1.2–4.0 (–5.0) cm wide; apices acute to acuminate; margins serrate to crenate-serrulate or subentire; bases round to broadly cuneate, subtruncate or attenuate, often oblique; adaxial surfaces deep green, glabrate to sparsely scabridulous; abaxial surfaces paler, glabrate or sparsely unicellular-puberulent on larger nerves; both sides moderately dotted with small, flattened, sessile glands ca. 0.08 mm wide, and puberulent to glabrate along edges. Flower clusters compact, 1–4, globose to hemispheric, 20–120-flowered, involucrate, 0.9–2.5 cm wide (at calyx level), the lower ones most distant and largest; involucreal leaves green, sometimes purplish; involucreal bracts numerous, loosely imbricate, the outer ones ovate to lanceolate, 7–16 mm long, 1.4–7.5 mm wide, acuminate, hirsute-ciliate, spreading in anthesis, pale green to carmine-purple, the inner ones grading to linear; pedicels 0.4–2.5 (–3.5) mm long, glabrate; calyx in anthesis slightly excurved, 5.0–8.6 mm long, the tube cylindrical, slightly campanulate or flaring, (2.5–) 3.2–4.8 (–5.3) mm long, distally with a transverse hispid annulus within, externally sparsely puberulent with trichomes mostly 0.03–0.10 mm long, a few up to 0.6 mm long, sparsely glandular-punctate; upper lip 0.7–1.7 mm long, the subulate teeth 1.2–3.2 mm long, distally setose, the setae (3–) 5–10, 0.6–2.0 (–2.5) mm long, the lower lip shorter, the teeth similar but 1.3–2.8 mm long, sparsely setose; corolla externally villous, (7.5) 8.8–12.0 mm long, the upper lip linear, 1.4–1.6 mm long, the lower lip broader, longer, 3.2–5.8 mm long, 2.4–4.2 mm wide (both densely pustulate), externally white or light lilac to mauve, internally irregularly purple-maculate on the lower lip. Fertile stamens 2, the filaments 5.5–8.4 mm long, the anthers versatile, slightly exerted, rose-purple and white to light yellow, ca. 0.8–1.2 mm long, the pollen white, hexacolpate, strongly suggesting a miniature cantaloupe in form and sculpture, ca. 0.040 mm long and 0.034 mm wide. Nutlets 4, commonly ovoid, 0.7–0.9 mm long, 0.5–0.7 mm thick, uniformly black to brown-spotted or brownish, shallowly alveolate. Chromosome number unknown.

TYPE: United States. Alabama. Madison Co.: ca. 8 km NE of New Market; T1S, R3E, Sect. 18 SW $\frac{1}{4}$, elev. 900–1100 ft., frequent on rich N-facing slopes over limestone, cove hardwoods S of Mountain Fork Creek, 1 June 1983, *R. W. Simmers 3423* (HOLOTYPE: GH; ISOTYPES: AUA, BH, BM, F, GH, K, MO, NCU, NY, PH, RSA, SMU, TENN, UNA, US, VDB).

ADDITIONAL SPECIMENS EXAMINED: U.S.A. Alabama. Jackson Co.: 6 mi. NW of Swain on AL HW 65, SW-facing limestone slope, cove hardwoods, 4 Jun 1975, *Massey & Whetstone 4601* (VDB); just W of dirt road along Hurricane Creek ca. 2 mi. S of Walls of Jericho, Hytop Quad., cove hardwoods over limestone, 19 May 1979, *Simmers 3256* (BH, GH, K, SMU, UNA, US, VDB); above Paint Rock Creek ca. 5 mi. N of Princeton, sandrock-boulder-strewn slopes over limestone, wooded bluffs, 7 Jun 1982, *Kral 68691* (GH, MO, NY, TENN, UNA, US, VDB); along AL 65 on NW side of Round Mt., recently logged steep, rich woods over limestone, occasional, T1S, R4E, Sect 17 NE $\frac{1}{4}$, 1 Jun 1983, *Simmers 3424* (VDB). Madison Co.: Northern end of Logan Point, north of Monte Sano, alt. 430 m, 31 May 1972, *Clausen 72-16* (GH); ca. 8 km NE of New Market, T1S, R3E, Sect 18 SW $\frac{1}{4}$, el. 900–1100 ft., frequent on rich N-facing slopes over limestone, cove hardwoods S of Mountain Fork Creek, 28 Jul 1972, *Simmers 2650* (GH, VDB), 17–18 May 1976, *Simmers 2963* (VDB); ca. 8 km NE of New Market, T1S, R3E, Sect 18 SW $\frac{1}{4}$, frequent on alluvial terrace on S side of Mountain Fork Creek, 27 May 1978, *Simmers 3181* (AUA, BH, F, GH, K, MO, NY, PH, RSA, SMU, US, VDB); W face Huntsville Mtn., at end of Deborah St., E. side Huntsville, limerocky, hardwood-forested *Cotinus* site, 17 Jun 1983, *Kral 70174* (GH, MO, US, VDB); Green Mountain, ca. 1300 ft. a.s.l., without date, *Cindy Drake, s.n.* (VDB).

DISCUSSION

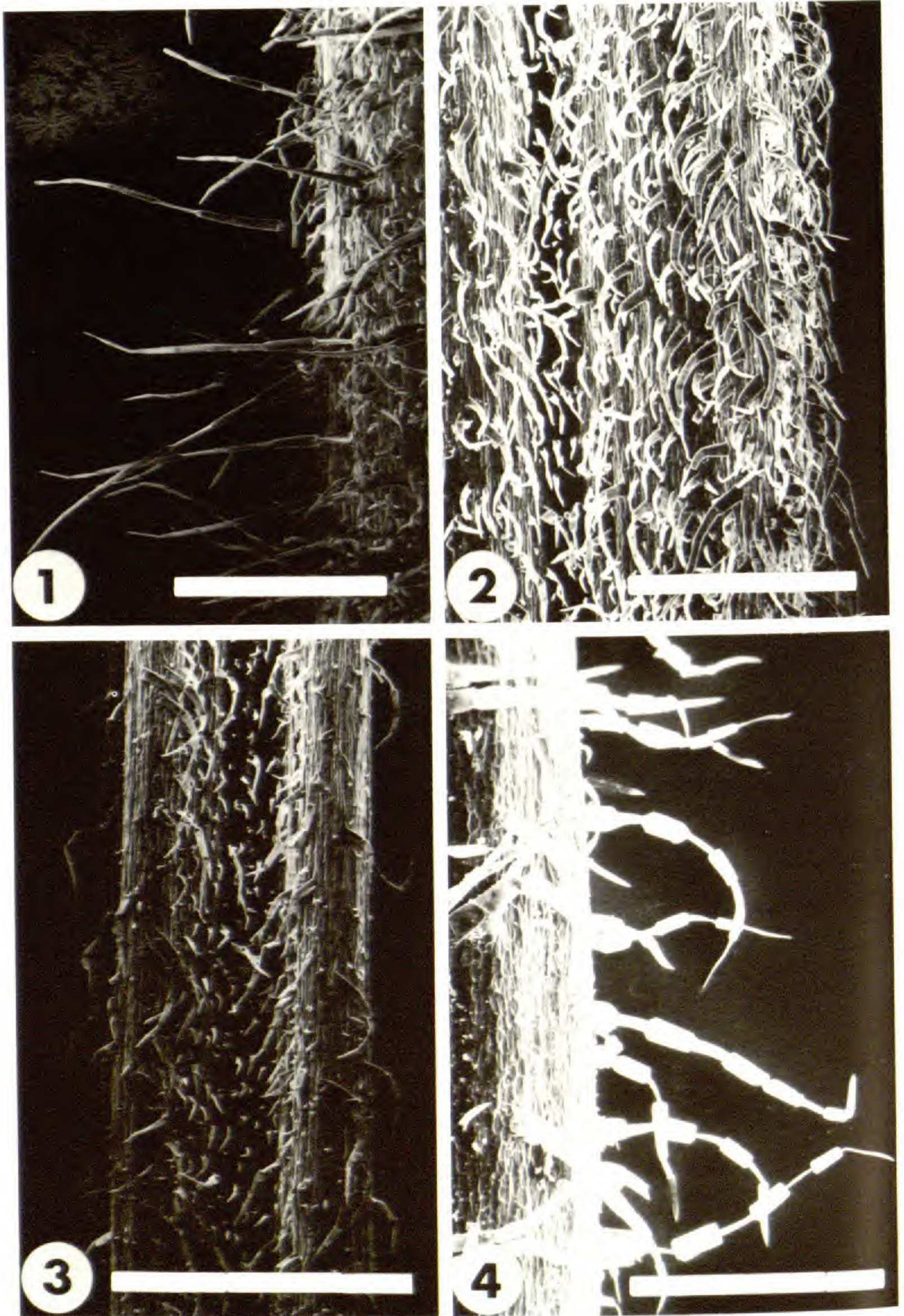
Blephilia subnuda is compared with the other two blephilias in Table 1. It stands nearest to *B. ciliata* in features of height, branching, calyx limb (relative length of teeth), bract ciliae, nutlet color and shape, and phenology. However, *B. subnuda* has longer petioles, thinner, smoother, sharper-tipped leaf blades, and smaller, paler corollas, and thus approaches *B. hirsuta* in these characters. As is true of many genera of Lamiaceae, the character and amount of vesture is given considerable weight, as are pigments. In *B. subnuda*, the most striking characters are in the smooth or virtually smooth lower and middle internodes, the smooth or nearly smooth leaf surfaces, the puberulent calyx-tube (trichomes over 0.6 mm long are lacking) and the smooth, decumbent offshoots produced after anthesis.

It is in degree and character of the trichomes of the stems, leaves and calyx, and to a lesser degree pigmentation, that the three species are best distinguished. Our observations are as follows:

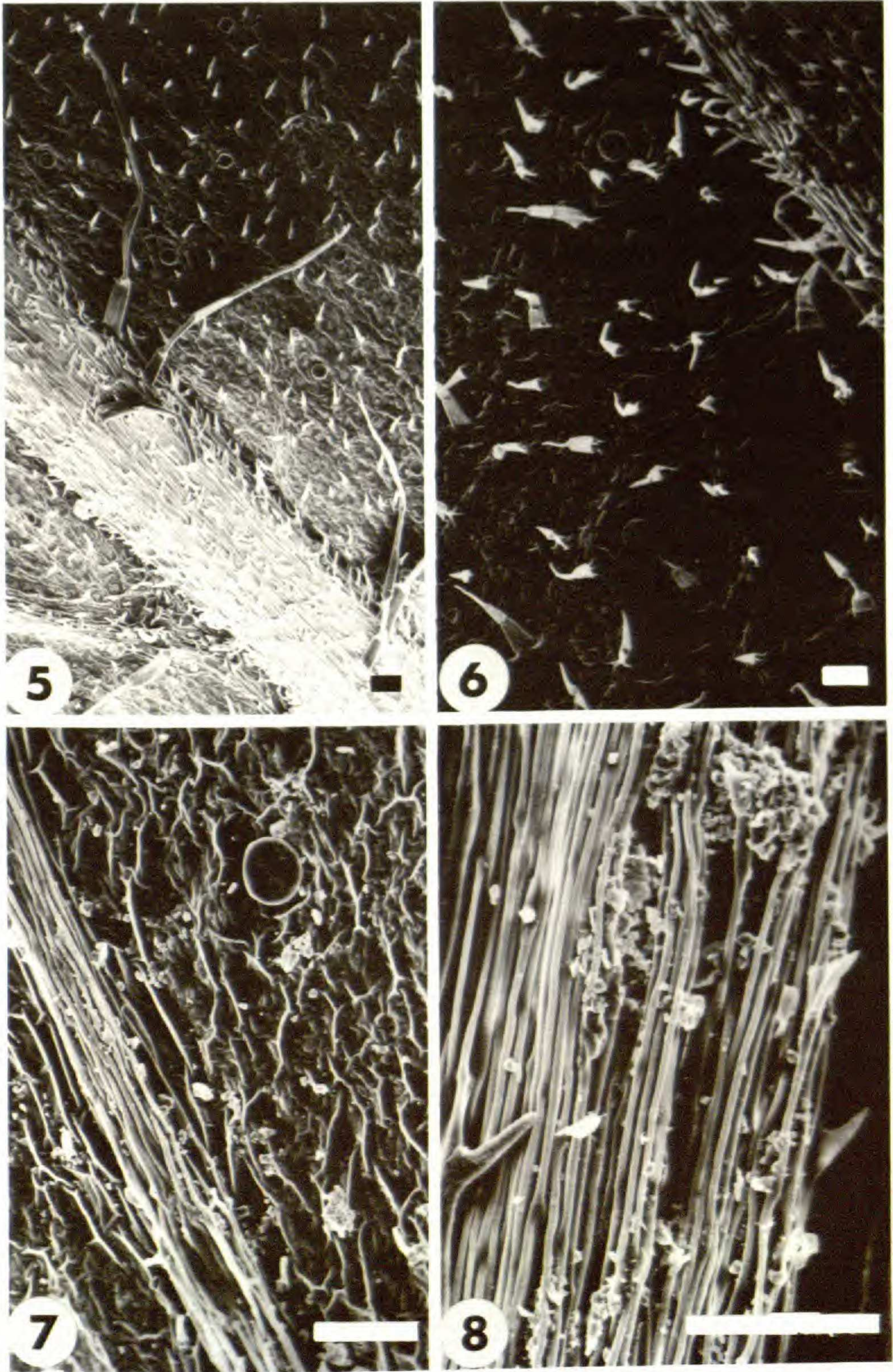
In *Blephilia ciliata*, the most common and most variable species, the slender stems rarely range higher than 8 dm. In the sun forms (the most common situation), stems are densely pale-recurved-puberulent proximally, on most plants densely so on suprapetiolar faces. This puberulence (Figure 1) may be with or

Table 1. Character states in *Blephilia* taxa.

Character	<i>B. ciliata</i>	<i>B. subnuda</i>	<i>B. hirsuta</i> (typical)
Offshoots	Stolons by anthesis	Decumbent shoots after anthesis	Erect to lax shoots by autumn
Height	28–88 cm	23–56 cm	50–135 cm
Branching	Rarely, short (usually under 15 cm)	Rarely, short when present	Usually several branches over 15 cm
Stem pubescence	Dense, short, usually retrose	Glabrate below middle, ± retrose above	Hirsute, spreading trichomes often 1–2 mm
Petiole length	1–12 mm	4–22 mm	9–42 mm
Blade shape	Oblong to elliptic to ovate	Variable, elliptic to ovate	Ovate (to lanceolate)
Apex of upper blades	Blunt	± acute	Acuminate to acute
Base of upper blades	Often cuneate	Variable, usually obtuse	Usually obtuse
Pubescence, abaxial side blades	Usually ± densely puberulent, may have some pilosity also	Glabrate, a few tiny unicellular trichomes on midvein	Pilose on larger nerves; tiny fine trichomes occasional
Calyx-tube length	4.0–8.4 mm	2.5–5.3 mm	2.2–3.6 mm
Calyx-tube pubescence	Long trichomes numerous, mostly slender, 0.6–2.4 mm	Puberulent, trichomes under 0.6 mm	Long trichomes frequent distally, ± twisted when dry
Length of upper calyx teeth	0.4–3.3 mm	1.2–3.2 mm	1.0–2.8 mm
Length of lower calyx teeth	1.2–3.5 mm	1.3–2.8 mm	0.5–1.3 mm
Corolla ground color	Shades of purple or blue	White or pale purple (lilac)	White
Time of anthesis (AL, TN)	May–June	Mid-May–Mid June	July–October (variants earlier)
Nutlet color	Black	Black, black with red-brown areas, or brown	Tan to reddish-brown



Figures 1-4. Stems (middle to upper internodes) of *Blephilia*. 1-2. *B. ciliata* from large population near Demopolis, Marengo Co., Alabama (Simmers 2952); pilose extreme, plant e; usual pubescence, plant a. 3. *B. subnuda* from type locality NE of New Market, Madison Co., Alabama (Simmers 3181). 4. *B. hirsuta* from Fletcher's Hollow, Marshall Co., Alabama (Simmers 3313). Scale bars = 1 mm.



Figures 5–8. Undersides of cauline leaf-blades of *Blephilia*. 5. *B. ciliata* from Highland Co., Virginia (*Simmers 3189-e*). 6. *B. ciliata* from Tuscaloosa Co., Alabama (*Simmers 2953-e*). Figures 7–8. *B. subnuda* from type locality, Madison Co., Alabama (*Simmers 3197*). Figure 7. Typical leaf; 8. Maximum density of trichomes on midvein. Scale bars = 0.1 mm.

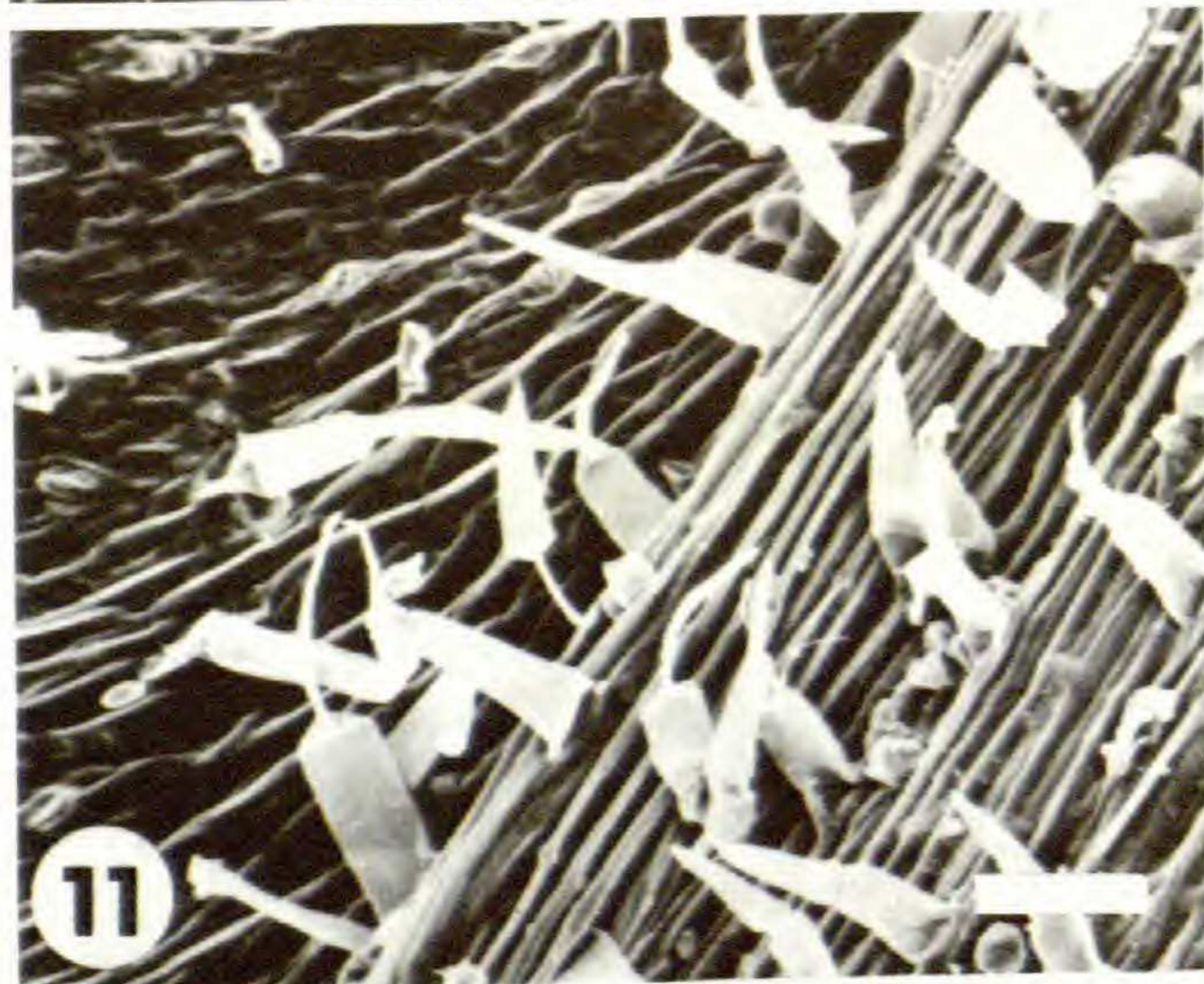
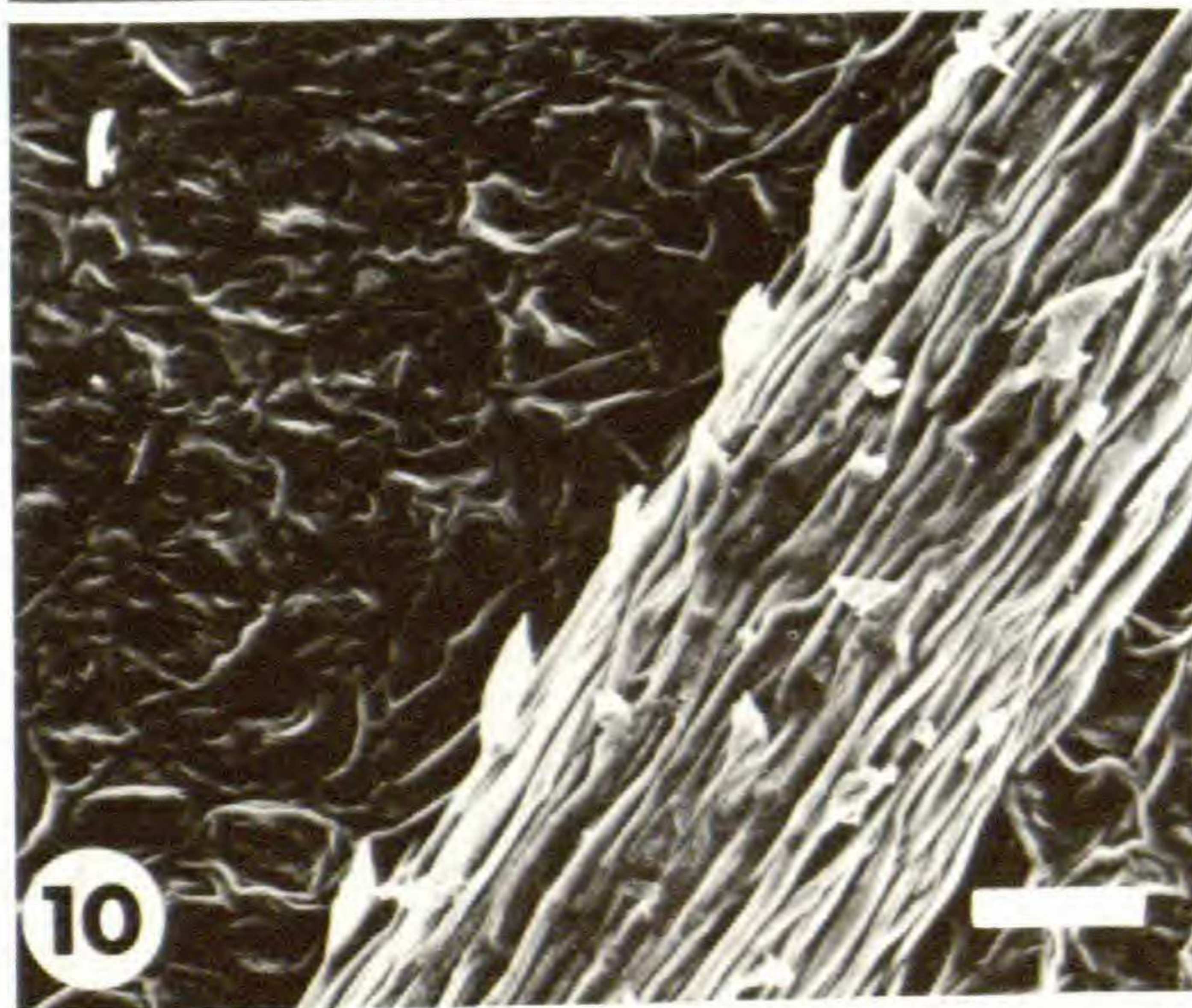
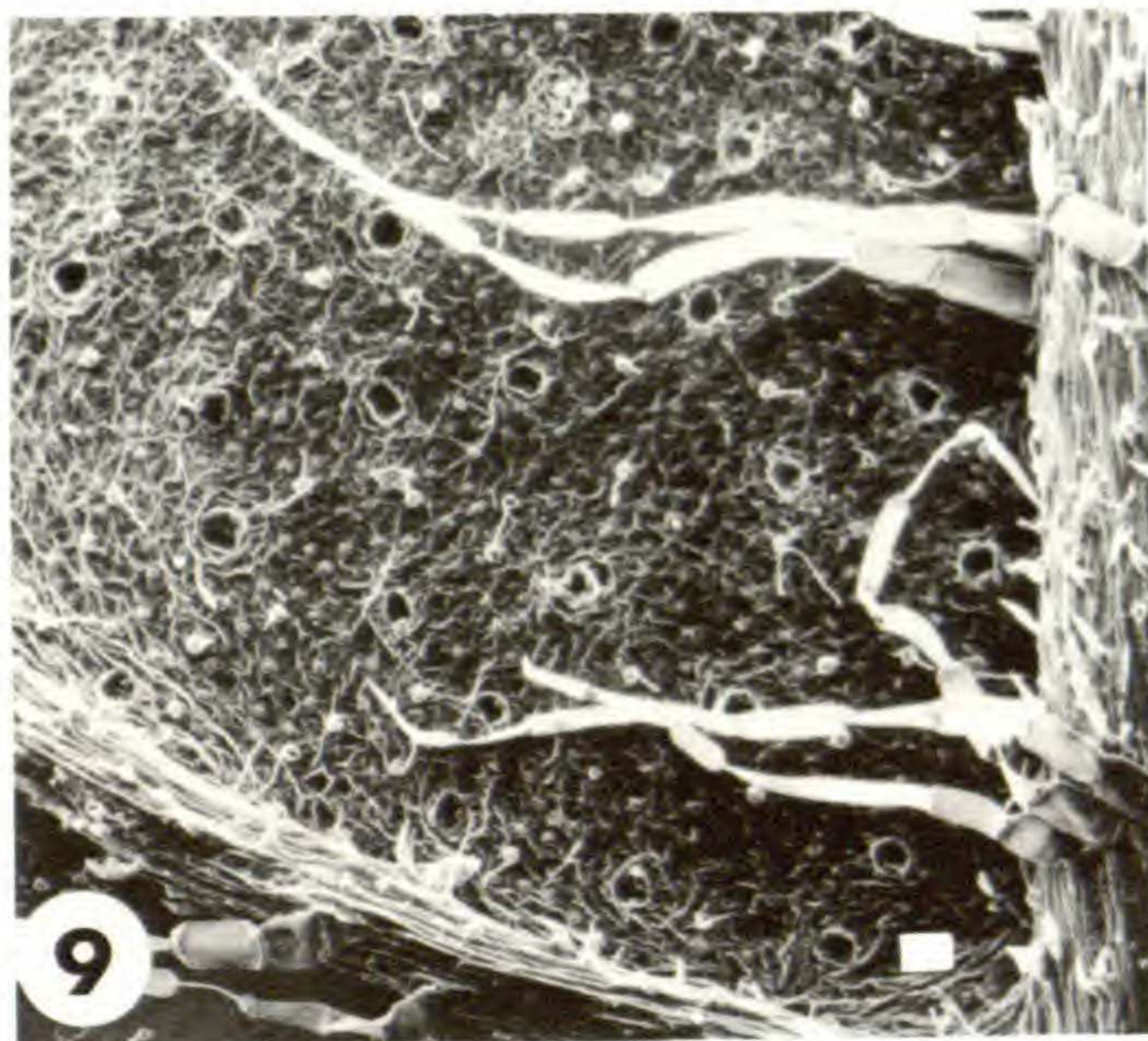
without a mingling of spreading long trichomes, particularly along stem angles, less often with such long trichomes predominant. Toward midstem a uniform puberulence may persist (Figure 2), or the vesture may consist solely of scattered or dense pilosity. Upstem, typically the pubescence becomes denser, of intermediate length, is recurved and often tomentose. The adaxial leaf blade surface is typically smoothish with scattered resin dots, the abaxial surface with short, usually soft, erect or curved puberulence, sometimes in addition with scattered pilose trichomes on the larger nerves (Figure 5). Both stems and leaves in these sun forms are generally more purple-pigmented than in the other two species. In shade forms there are extremes in which stem pubescence may be almost uniformly scattered-pilose and the thinner leaves scattered-pilose on both surfaces, rarely nearly smooth save for puberulence on the nerves beneath (Figure 6).

In typical *Blephilia hirsuta*, a strong plant usually exceeds 1 meter; the stems are thicker and softer. Stem pubescence is more uniformly long, spreading, and often villous (Figure 4); it ranges over the lower and median internodes from sparse to copious, particularly along angles and at nodes. Upstem pubescence becomes thicker and is often tomentose. In addition, the stems have frequent recurved to appressed puberulence and occasional glands. The principal leaf-blades of *B. hirsuta*, the largest in the genus, often are totally smooth between veins with scattered, often crisped pilosity confined to larger veins above (Figure 9), the sessile glands scattered, wider, more depressed, and paler. There are also occasional fine, possibly glandular trichomes present on the larger veins (Figures 9, 11), as well as puberulence. The calyx (Figures 14, 17) and involucre bracts have longer, softer, more villous pubescence than in other blephilias.

Blephilia subnuda, as noted in Table 1 and in the description, is the smoothest blephilia; the lower and often midstem internodes are totally smooth or with scattered recurved puberulence and have tiny resin-dots only. Upstem the pubescence becomes

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Figures 9–11. Undersides of cauline leaf blades of *B. hirsuta*. **9.** from Varna, Tompkins Co., New York (*Simmers* 2992-5). **10.** from Little River trail near Elkmont, Great Smoky Mountains National Park, Sevier Co., Tennessee (*Patrick & Simmers* 3186-b). **11.** from Fletcher's Hollow, Marshall Co., Alabama (*Simmers* 3225). Scale bars = 0.1 mm.



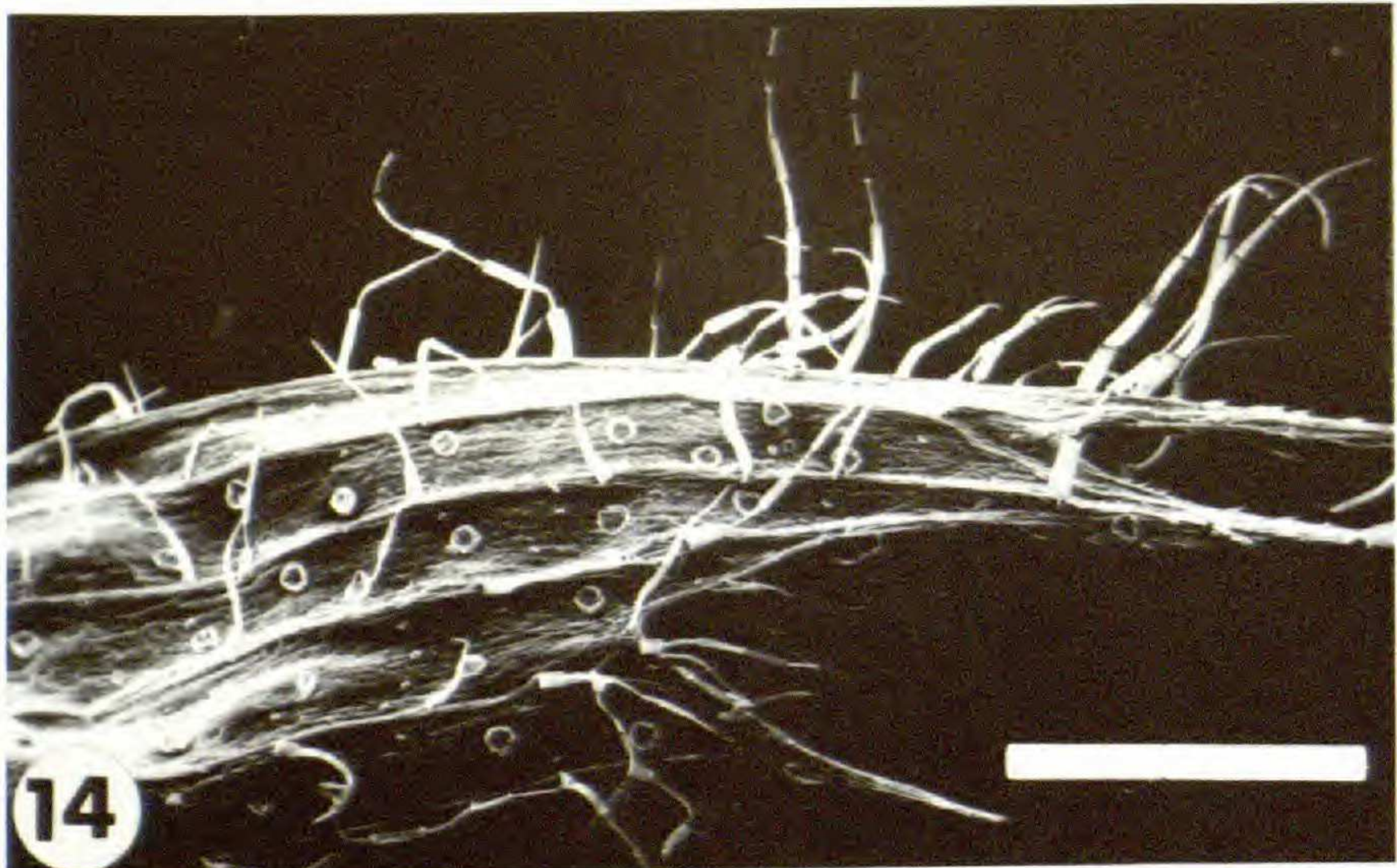
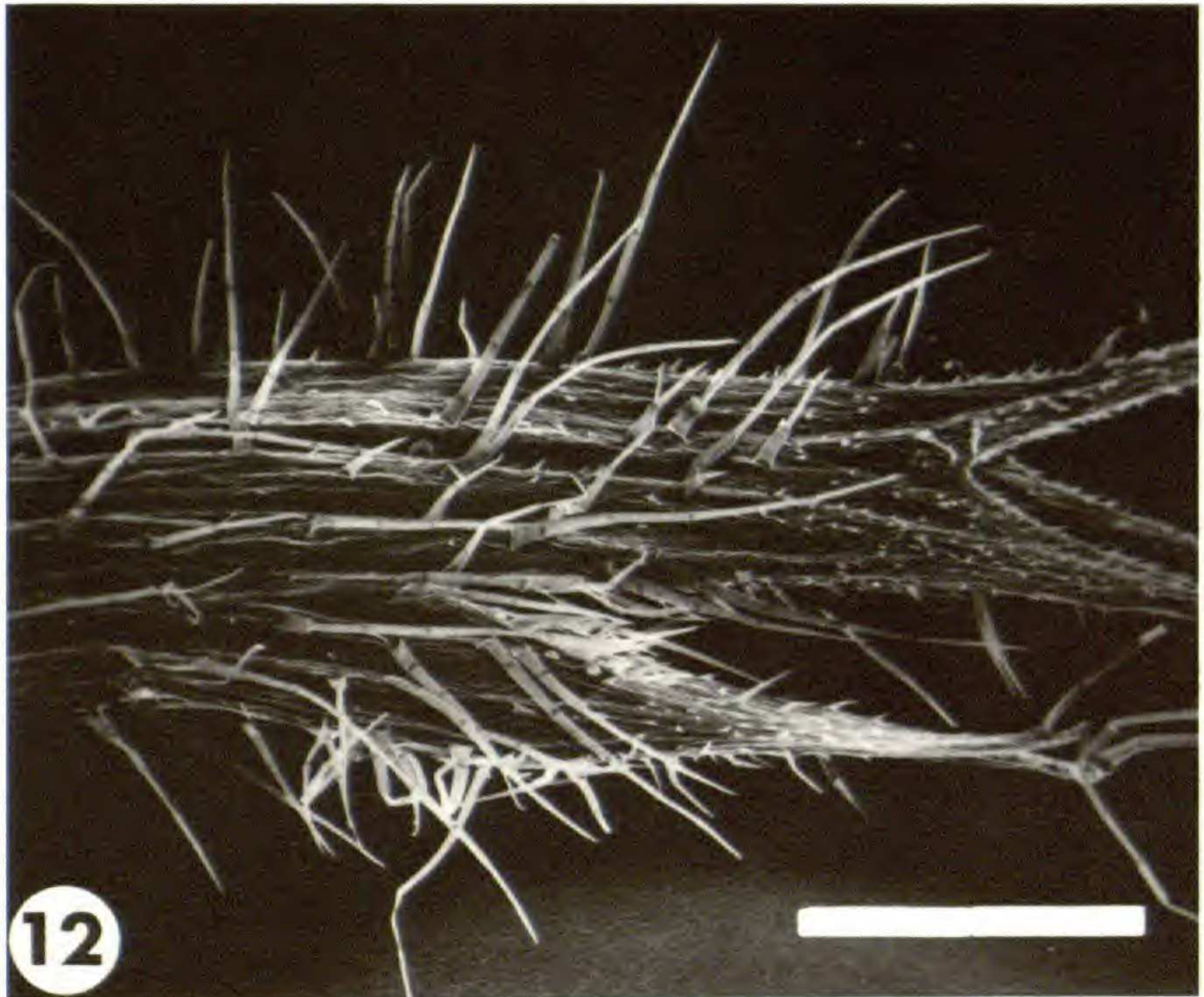
moderately dense on angles and faces above the petioles (Figure 3); the longer trichomes (0.5–1.5 mm long) are concentrated on the angles, the shorter ones are more numerous in the grooves. Adaxial leaf surfaces are often totally glabrous other than for glands or a few scattered trichomes on larger veins (Figure 8). The calyx tubes (Figures 13, 16) are puberulent with mainly unicellular trichomes 0.03–0.10 mm long with a few longer trichomes, especially at the orifice. The teeth of the upper calyx lip often have more numerous (5–10) setae at or close to their tips than are found in other *Blephilia*.

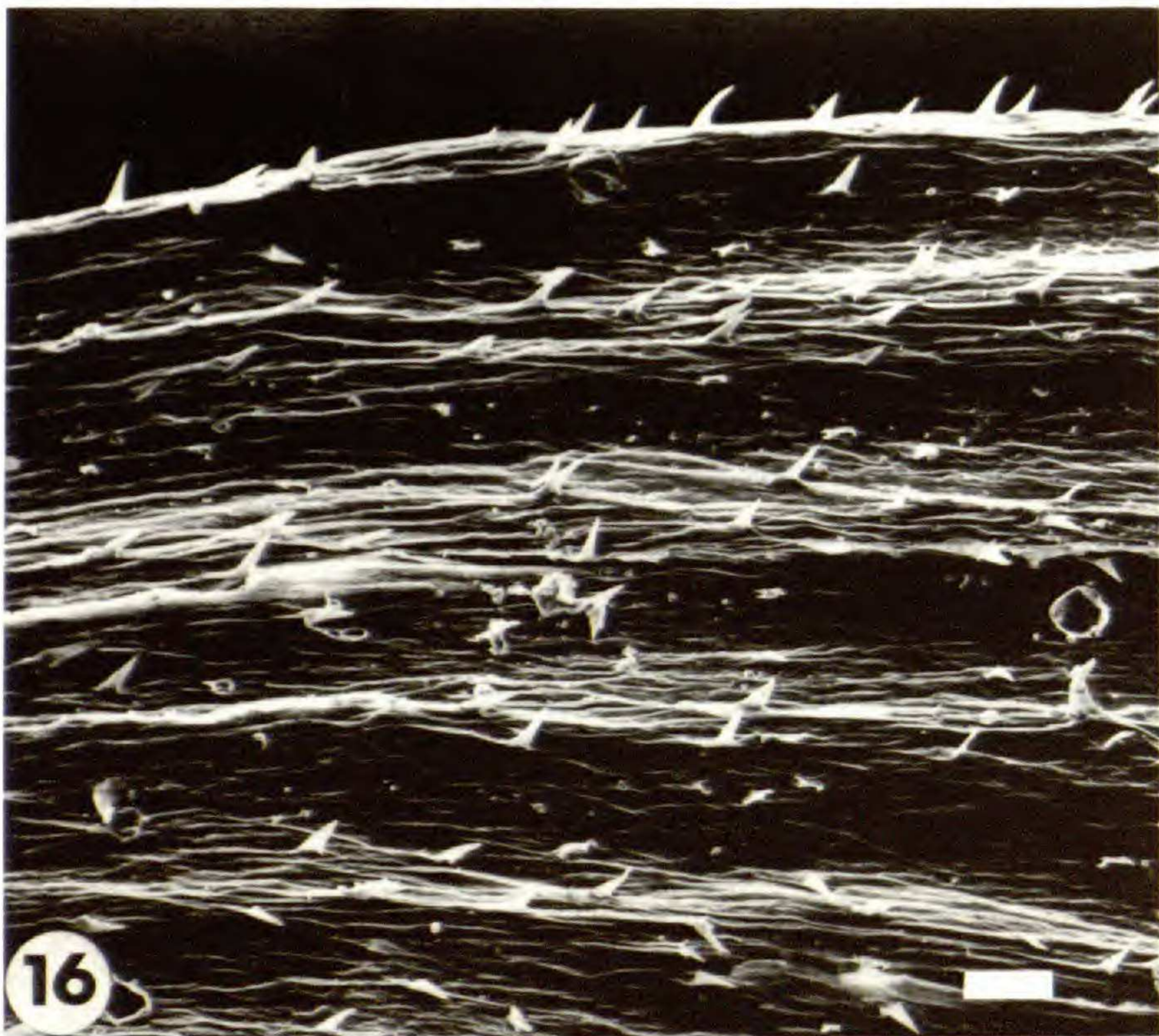
Occasional populations of *Blephilia*, especially in the Great Smoky Mountains of Tennessee (e.g., *Patrick & Simmers 3186*), which have stems glabrate proximally and have glabrate leaves nonetheless differ significantly from *B. subnuda*, particularly in ways that align them more with *B. hirsuta*. Such plants in summer or autumn produce strongly pubescent offshoot stems (field-checked by the senior author in November, 1979), and have a more uniform pubescence on upper parts of flowering/fruiting stems. They have relatively short petioles (3–15 mm) and the blades of upper cauline leaves are ovate to lanceolate, are acuminate with the larger nerves (midvein at least) abaxially rather densely puberulent (Figure 10), much more so than in *B. subnuda* (compare with Figure 8). Their nutlets are fuscous (dark brown), much darker than is true for typical *B. hirsuta*, in which they are tan to reddish-brown. These Smoky Mountain plants are considered here to be closest to *B. hirsuta*; possibly they have been introgressed or mixed with genes from *B. ciliata*, as is strongly suggested by the character states of petiole length, nutlet color, and relatively early phenology (often being in anthesis in June).

Fernald (see Day, 1899, p. 221, fn.) described *Blephilia hirsuta* var. *glabrata* from specimens collected by M. A. Day from a population on Mt. Equinox in Vermont (GH! NEBC!). Unfortunately, Fernald, who cited *Day 140 & 141*, did not indicate which of these he considered typical! The lot is variable, suggesting

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Figures 12–14. Calyces of *Blephilia*. 12. *B. ciliata* from Tuscaloosa Co., Alabama (*Simmers 2953-e*). 13. *B. subnuda* from type locality NE of New Market, Madison Co., Alabama (*Simmers 3181*). 14. *B. hirsuta* from Fletcher's Hollow, Grant, Marshall Co., Alabama (*Simmers 3225-g*). Scale bars = 1 mm.





a hybrid swarm, but none of them is much like the Alabama plants here named *B. subnuda*. One of the Day collections (*Day 141*) is nearly identical to the above-described Smoky Mountains plants, particularly as to the strongly puberulent larger nerves on its cauline leaves.

To summarize, we have a species that combines several of the salient characters of each of the two previously described *Blephilia* but which adds some distinctive features of its own, particularly a unique vesture (especially of the calyx). We consider that it is most likely that *B. subnuda* represents a stabilized hybrid. Features of vesture are an indication that selection of these characters has occurred since the initial hybridization event. A recent collection (*Simmers 1990-7*) from a population in DeKalb County, Tennessee is intermediate between *B. ciliata* and *B. hirsuta* but is unlike *B. subnuda* primarily in being densely pilose on stem and (usually) leaf; its calyx-tubes have longer trichomes than do those of *B. subnuda*. The corolla ground color of these DeKalb County plants is fairly uniformly pale violet. A few specimens close to typical *B. ciliata* have been observed and collected (*Simmers 1990-8*) on the fringe of this population, but are outside our concept of *B. subnuda*.

Blephilia subnuda has been found thus far only in two counties of northeastern Alabama north of the Tennessee River on the Mississippian limestones of the dissected Cumberland Plateau. In this region it often associates with rarities such as *Neviusia alabamensis* A. Gray and *Viburnum bracteatum* Rehder. Within its known range it is the most abundant *Blephilia*; it is locally frequent to fairly abundant, usually on shaded, moist outcrops of limestone or on slightly disturbed, fairly shaded sites including alluvial terraces. We have not found *B. ciliata* within the range of *B. subnuda*, but *B. ciliata* has been collected just outside it in Huntsville, Madison Co. (*Jada Leo, s.n., vDB*). Populations of *Blephilia* closest to *B. hirsuta* but having reduced pubescence occur within the range of *B. subnuda* in Jackson Co., Alabama (*Kral 47572, 47574, vDB; Simmers 3470 & 3741, vDB, etc.*); these

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Figures 15–17. Calyces of *Blephilia*. **15.** *B. ciliata* from near Demopolis, Marengo Co., Alabama (*Simmers 3255-n*). **16.** *B. subnuda* from type locality NE of New Market, Madison Co., Alabama (*Simmers 3181*). **17.** *B. hirsuta* from Teal Hollow, Lincoln Co., Tennessee (*Simmers 3283-b*). Scale bars = 0.1 mm.

populations were not observed within 1 km of known populations of *B. subnuda*. The upland region where this endemic grows has a higher rainfall than do the surrounding areas. Therefore it is possible that the greatly reduced pubescence of *B. subnuda* is an adaptation to local environmental conditions.

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